UCRL-JC-124905 Abs

Modeling of Self-Focusing Experiments Validates LLNL's Propagation Codes*

J.M. Auerbach, M.A. Henesian, J.T. Hunt, J.K. Lawson, K.R. Manes, D. Milam, P.A. Renard, R.A. Sacks, D.R. Speck, W.H Williams, C.C. Widmayer, C.D. Orth, and S.W. Haney

Lawrence Livermore National Laboratory
P.O. Box 808, L-490
Livermore, CA 94550 USA

(510) 422-5328/FAX (510) 423-6506

[Abstract submitted to 2nd Annual International Conference on Solid-State Lasers for Application to Inertial Confinement Fusion (ICF), Paris, France (1996)]

Abstract

Computer codes that model the propagation of intense laser beams through laser systems have played key roles in the design and analysis of all the Inertial Confinement Fusion Lasers built at the Lawrence Livermore National Laboratory (LLNL). These codes treat, at various levels of sophistication, the effects of linear diffraction, loss, amplification, beam perturbation by self-focusing, and frequency conversion. It is important that these codes be validated, because staging and architecture decisions (which often involve significant cost consequences) are driven by risk-of-damage assessments made using them. Over the past year, LLNL's propagation and harmonic conversion software has been benchmarked against analytical propagation cases, nonlinear perturbation analyses, earlier-generation laser propagation codes, and most important, against the results of specially designed experiments. This paper describes comparisons of the codes with results of self-focusing experiments conducted in the Optical Sciences Laser (OSL) Facility. With no adjustable or fitting parameters, we simulated 1ω and 3ω pseudoscopic image formation of a small wire. Our calculations were within 15% at 1ω and 20% at 3ω. We also successfully modeled the onset of filamentation tracking in bulk SiO_2 at both wavelengths.

*Work performed under the auspices of the U.S. Department of Energy by the Lawrence Livermore National Laboratory under contract number W-7405-ENG-48.